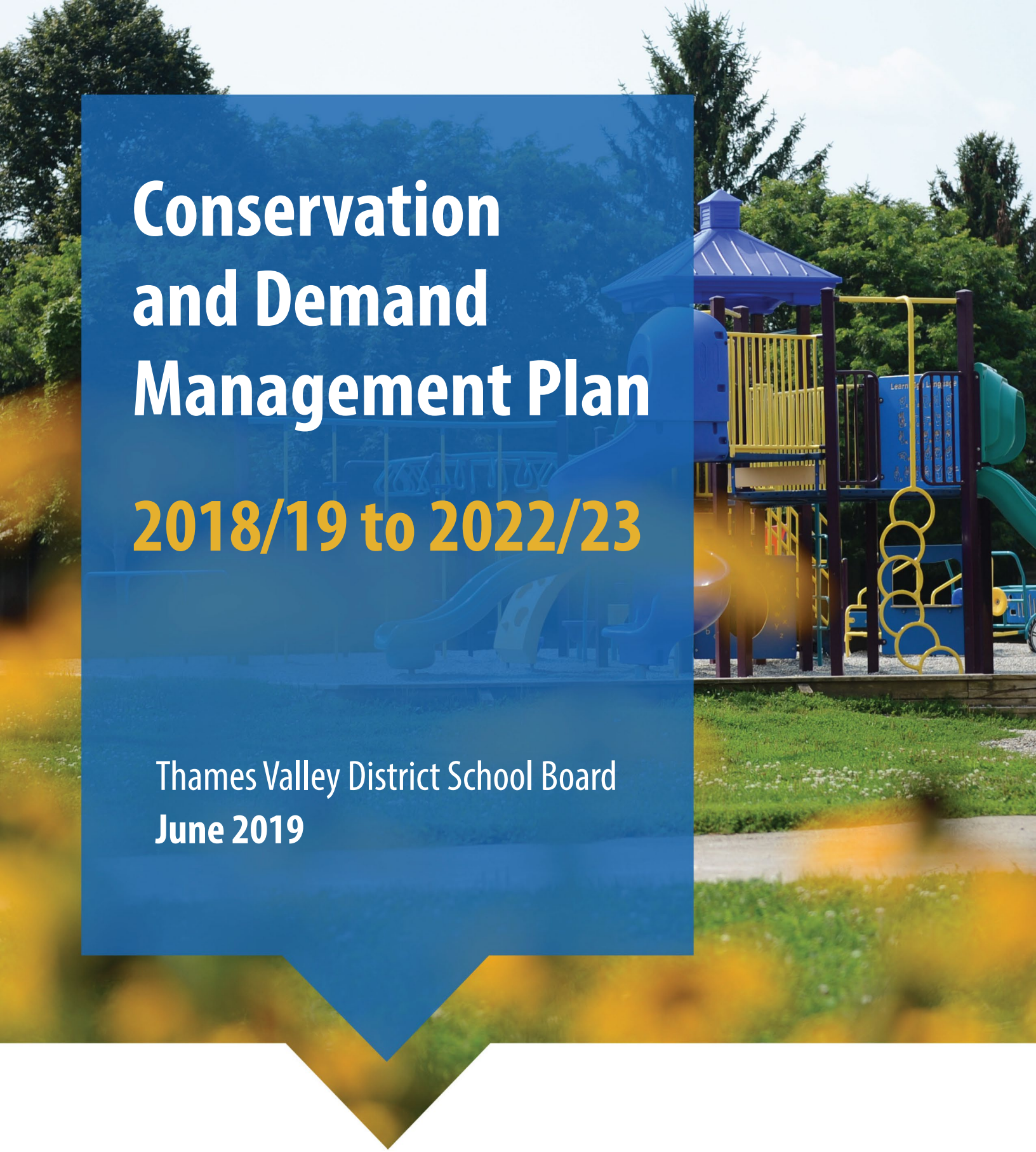

Conservation and Demand Management Plan

2018/19 to 2022/23

Thames Valley District School Board

June 2019

Thames Valley
District School Board

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Thames Valley District School Board

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1. Introduction

In 2013, all Ontario public agencies were required to start publicly reporting their annual energy consumption and Greenhouse Gas (GHG) Emissions as per Ontario Regulation 397/11, part of the Green Energy Act. Included in this regulation, in 2014, Ontario Public agencies were required to create and publish a 5 year Conservation and Demand Management (CDM) plan. In 2018, these reporting requirements moved to Ontario Regulation 507/18, part of the Electricity Act. All reporting requirements remained the same.

The goal of the legislation is to help public agencies manage their energy use through the ability to evaluate facilities from across the province, creating benchmarks for future goals to be set against and in the future identifying best practices and energy-savings opportunities.

Thames Valley District School Board (TVDSB) is committed to reducing the impact its operations have on the environment through effective energy conservation practices and further develop programs that foster environmentally responsible activities.

2. Funding and Energy Management Planning Background

2.1. Funding and Energy Management Planning

All school boards receive the majority of their funding from the Ministry of Education (MOE). The MOE announces each Boards funding allocation in March for the next school board fiscal year which operates from September 1st to August 31st. The MOE does not provide boards with multi-year funding allocations. Therefore, the ability to implement a 5 year energy management strategy is contingent on MOE funding.

2.2. Asset Portfolios and Energy Management Planning

The education sector is unique in that a board's asset portfolio can experience significant changes that will affect a board's energy consumption over a five-year period.

Table 1: Variables That Affect Energy Consumption

Facility Variables	Occupancy Variables

• Facility age
• Site/facility layout
  ○ Number of floors
  ○ floorplan
  ○ Orientation of the building
• Building area
• Portables
• Mechanical and electrical equipment/ systems
• Air conditioning
• Site use
• Shared use sites
  ○ Pools
  ○ Libraries
  ○ Family centres
  ○ Day cares
	• Shared use sites
	  ○ Extended hours of operation
	• Community use
	• School programs
	  ○ Before/ afterschool programs
	  ○ Summer school

3. Thames Valley District School Board

TVDSB has approximately 78,000 students covering 7000 square kilometres of Southwestern Ontario. TVDSB facilities include: 132 elementary schools, 27 secondary schools, 6 continuing education sites, 4 environmental centres, and 5 administrative facilities. Our students and almost 10,000 staff are situated in over 1 million square metres of floor space. TVDSB's energy usage for the FY 2017-18 year consisted of:

- Over 70,000,000 kWh of electricity
- Over 10,000,000 cubic metres of natural gas
- Over 100,000 Litres of Propane
- 500,000 cubic metres of Water

TVDSB continues to investigate innovative strategies to reduce energy consumption in order to minimize budget increases due to energy continually increasing in cost.

4. Energy Management

TVDSB's energy management strategy has included the following:

- *To procure energy commodities required by TVDSB at the lowest possible price while ensuring budget stability.*

- *To research, evaluate and install building systems that reduce energy consumption.*
- *To research and evaluate emerging energy strategies and implement pilot projects where appropriate.*
- *To monitor and track energy usage to ensure our facilities are operating effectively and efficiently.*

TVDSB's energy conservation activities focused on design, retrofit, construction and facility renewal.

4.1. TVDSB's Asset Portfolio

As outlined below in Table 2, TVDSB has experienced a significant change in fundamental factors that affect energy consumption. Increases in operating facilities, total square footage and average daily enrolment have contributed significant pressure on energy budgets. Section 5 below also outlines several other variables that have an impact on energy consumption at TVDSB.

Table 2: TVDSB Portfolio change Baseline to 2017/18

	FY 2012-13 (Baseline)	**FY 2017-18**	**Variance**
Total number of buildings	178	182	+2.2%
Total number of portables/portapaks	244	225	-7.8%
Total floor area(m^2)	966757	1009014	+4.4%
Average daily enrolment	69007	75757	+9.8%

Source: October 31st Data from Planning Department

4.2. Review of Performance to Plan

TVDSB utilizes ekWh[1] as a unit of measure to track total energy consumption. The unit of measures allows conversion comparisons between different fuel sources. Table 2 below summarizes changes in total metered[2] energy consumption per fuel source over the past five years.

Table 3: Energy Consumption Baseline to FY 2017-18

[1] EkWh is Equivalent kilowatt-hour and is used to convert different types of energy into a common term of kilowatt-hour. Allowing for comparison of energy use in a facility no matter what fuels are used.

2 Metered consumption is the quantity of energy used and does not include a loss adjustment value (the quantity of energy lost in transmission).

	FY 2012-13 (Baseline)	FY 2017-18	Variance
Electricity (kWh)	71,400,509	72,122,492	+1.0%
Natural gas (ekWh)	135,502,775	128,350,194	-5.3%
Total #2 fuel oil (ekWh)	700,962	0	-100%
Total propane (ekWh)	322,677	812,408	+152%
Total metered energy consumption (ekWh)	207,926,923	201,285,094	-3.2%
Metered energy intensity[3](ekWh/M^2)	215.1	199.5	-7.2%

As part of the TVDSB's energy management strategy over the past 5 years TVDSB has removed all fuel oil heating systems by the elimination of #2 fuel oil consumption completed through the transition to propane fuels. Changing from #2 fuel oil to Propane provides many benefits to TVDSB such as increased equipment efficiency, lower energy costs and lower Greenhouse Gas Emissions[4].

TVDSB achieved a 3.2% total metered reduction in energy usage over the past five years. Table 3 does not take into account the effect that weather has on the energy consumption of TVDSB facilities.

4.3. Weather Normalized Energy Consumption:

Weather changes on a yearly basis and the amount of energy consumed is dependent on these seasonal changes. When comparing energy consumption data from year to year, the use of metered data does not take into account the effect that weather may have on energy consumption. The process of weather normalization removes weather's effect on energy consumption and provides a means to compare energy usage from year to year. Heating degree-days[5] (HDD) and cooling degree-days[6] (CDD) are used along with the average usage over a defined period to calculate the energy consumption without the effect of weather. Table 4 below compares weather normalized data for the baseline year to the latest fiscal year that is complete.

[3] Energy Intensity is the total energy input into a facility divided by the floor area of facility. It is a tool to compare facilities energy use over period of time or against other facilities.
[4] Greenhouse gas emissions are commonly referred to as emissions from the operation of facility that contribute to the Greenhouse effect. The most prevalent GHG emissions that occur during the operation of a facility come from fuel burning appliances.
[5] HDD or heating degree-days is a measurement of the demand for energy to heat a building. It is the number of degrees that the average daily temperature is below 18 degrees Celsius.
[6] CDD or cooling degree-days is a measurement of the demand for energy to cool a building. It is the number of degrees that the average daily temperature is above 18 degrees Celsius.

Table 4: Weather Normalized ekWh

Weather Normalized Values	FY 2012-13 (Baseline)	FY 2017-18
Total energy consumed (ekWh)	*213,023,364*	*195,793,061*
Energy intensity (ekWh/M^2)	*220.3*	*194.0*

Notes: Weather normalization calculation assumptions: 92% of Natural gas consumption is related to heating, 5% of electrical consumption is related to mechanical cooling and a 5 year rolling average for base degree-days.
Source: Sustainable schools Methodology White Paper for the top energy performing Boards report.

4.4. Energy Conservation Goals

In 2014, TVDSB set the energy conservation goal of reducing usage by 6.5% over five years. In fiscal year 2017-18, TVDSB achieved a reduction of 11.1% in energy intensity from the previous 5 years. Table 5 compares the energy intensity conservation goal with the actual performance and surpassed energy conservation goals.

Table 5: Energy Intensity Comparison- Goal to Actual Performance

	ekWh/M^2	%
Energy Intensity reduction goal from FY 2013-14 to FY 2017-18	11.1	6.5
Actual reduction- FY 2017-18	23.5	11.1

4.5. Renewable Energy Production

TVDSB has 120KW of Solar Photovoltaic capacity installed on multiple sites and in multiple configurations. Over the life of the installations, 650 mWh of electricity has been produced that was either part of a Micro-FIT[7] contract or used to offset energy consumption at the schools through a net metering agreement[8] with the local distribution company.

4.6. Energy Efficiency Incentives

[7] Micro- FIT- Micro Feed-in-Tariff is a contract with the Independent Electricity System Operator (IESO) that pays a set rate for Electricity produced via the solar Photovoltaic system. These contracts are no longer available.
[8] Net metering Agreement is an agreement with the Local Distribution company(LDC) where the solar PV system is connected to the power grid and offsets the facilities usage by the amount the PV system produces and if the system produce excess, the utility will reduce

Incentive programs are offered by a number of utility companies that provide monetary rebates to organizations who demonstrate that an implemented energy conservation project can reduce utility consumption. Over the last 5 years, TVDSB has been successful in these applications and has received over $ 564,000 in incentives.

TVDSB employs the services of the MOE Incentive Programs Advisor (IPA) where applicable. The expectation is that TVDSB will expand their use of the IPA with the recent changes that have moved the available electrical conservation incentives from the local LDC's (Local Distribution Company, for example London Hydro) to the IESO (Independent Electricity System Operator).

TVDSB reinvests incentive funding back into energy management projects such as boiler plant retrofits, lighting upgrades and Building Automation Systems.

5. Energy Conservation Challenges

Due to multiple factors since the spring of 2014 as outlined below, TVDSB has experienced challenges in achieving the conservation forecast goals. These unforeseen factors can limit TVDSBs ability to conserve energy as projected in various initiatives.

Some of these factors include:

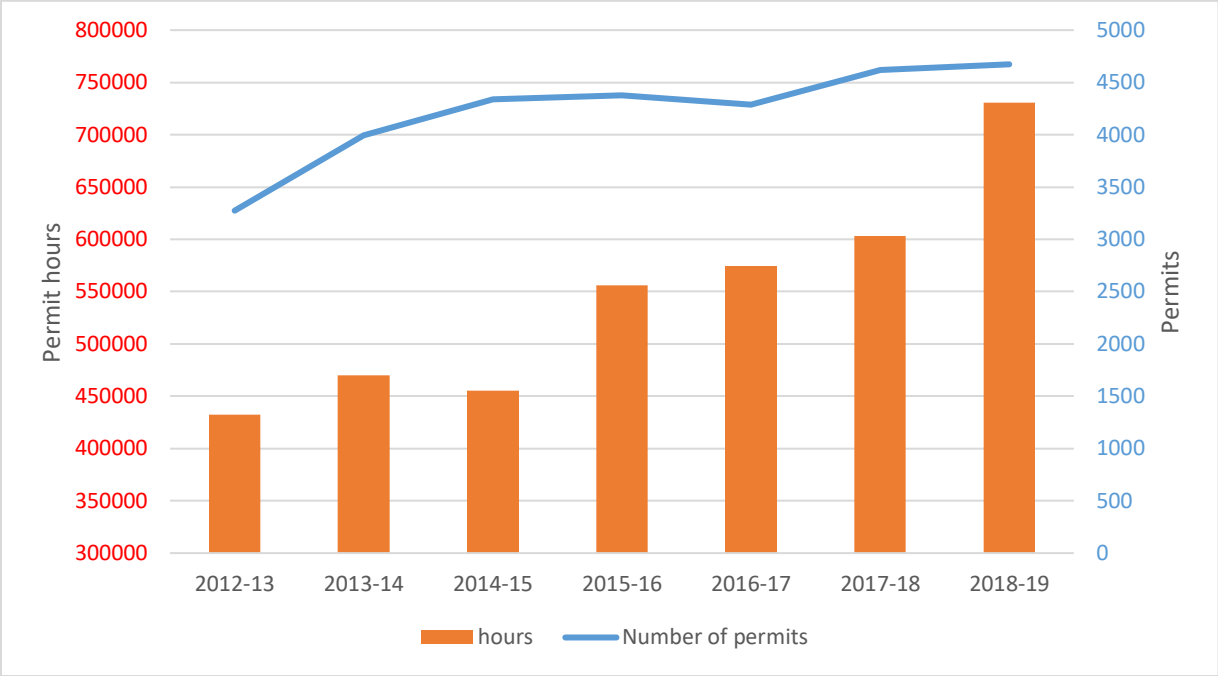
5.1. Unbalanced Utilization of Schools

Over the period of the 2013-14 to 2018-19 Conservation and Demand Management (CDM) plan, TVDSB has experienced accommodation pressures that have resulted in over-utilization and under-utilization of schools. When enrolment increases in an unbalanced manner, energy consumption increases at over-utilized schools due to additional temporary accommodation space (modular portable classrooms) yet empty classrooms at under-utilized schools still require energy to be supported in a manner that allows them to be reoccupied when required.

5.2. Community Use of Schools and Community Hubs

The MOE has encouraged collaborations with community partners to utilize schools as community hubs. The MOE introduced funding to all school boards to make school space more affordable for use after hours. Both indoor and outdoor school space is available to not-for-profit community groups at reduced rates, outside of regular school hours. TVDSB has also entered into several reciprocal use agreements with community partners, which further increases the use of facilities. Figure 1 illustrates the rise in after-hours use of TVDSB facilities.

Figure 1: Community Use of Schools 2012-2018

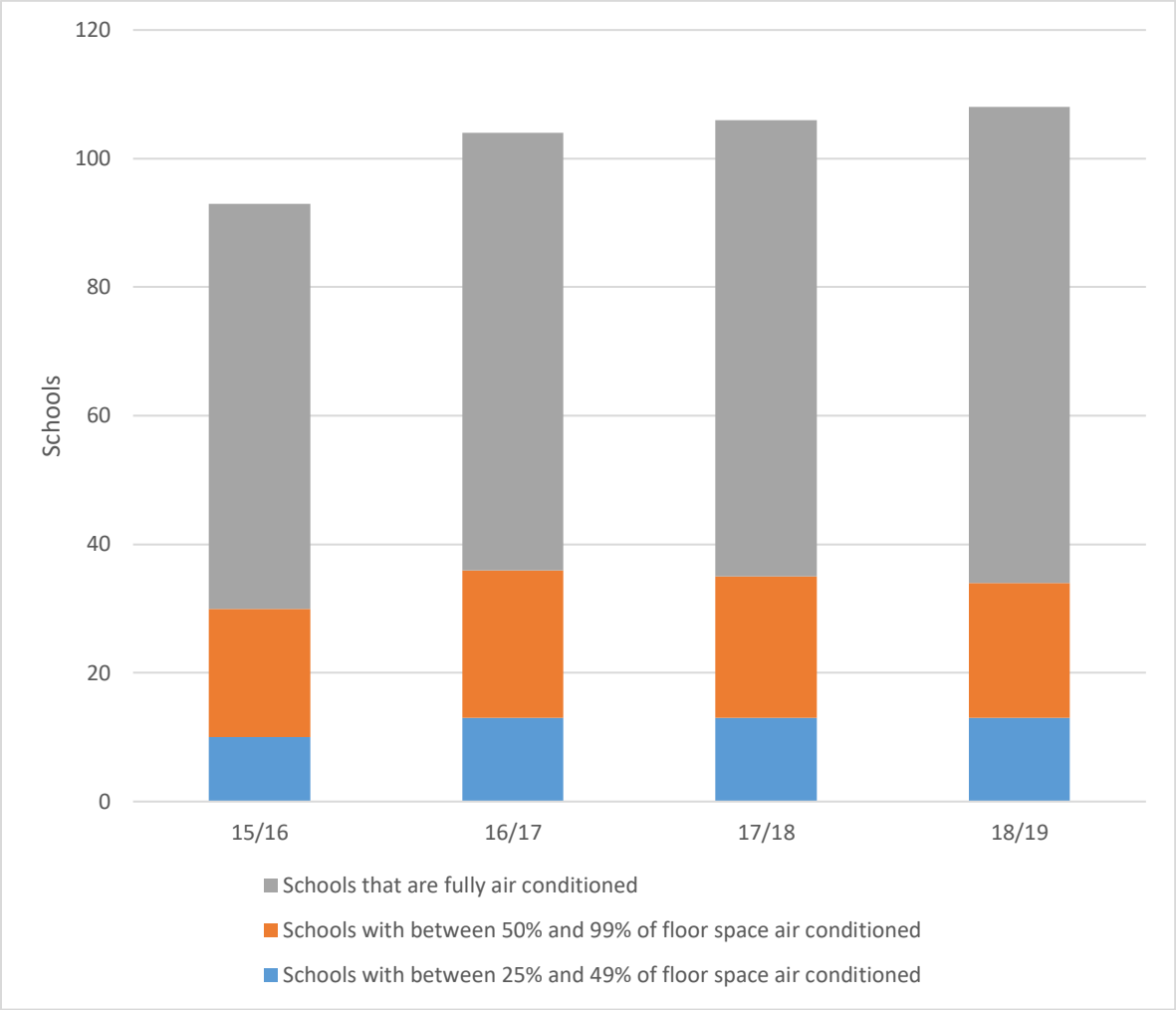


The increased community collaboration has resulted in an increased amount of permits being issued. As a result, more are using the schools longer and more frequently.

5.3. Air Conditioning

Pending available budgets TVDSB will provide air conditioning in schools through new builds, and major additions/ renovations/ renewal projects. While improving comfort for the students, the energy consumption of a school will increase after installation of air conditioning systems. Figure 2 illustrates the increasing number of schools that have air-conditioning throughout TVDSB.

Figure 2: TVDSB Air Conditioned Schools



5.4. Full Day Kindergarten (FDK)

The introduction of FDK resulted in many new pupil places being created through new programming opportunities. To accommodate the increased enrolment TVDSB completed new additions or extensive renovations of existing facilities that resulted in an increase in energy consumption.

5.5. Before and After School Programs

The before and after school programs were expanded through the introduction of FDK to support this initiative. The program extends the operating hours of the facilities and requires operating the school's heating ventilating and air conditioning (HVAC) systems increasing energy consumption.

5.6. Compliance with current Ontario Building Code (OBC)

Any additions or renovations are required to meet current OBC. Depending on the original design and function of the area being renovated, the school's energy consumption may increase with the increase in the footprint. The main contributors to any increase would be the HVAC system.

6. Energy Conservation Projects: FY 2013-14 to FY 2017-18

TVDSB utilizes capital funding grants to complete energy conservation projects. A list of the projects completed, associated costs, and fiscal year that the projects were implemented within the TVDSB are outlined in *Appendix A.*

Projects listed include any projects that demonstrate a reduction in energy. Attached costs are for the complete project and not just the cost of the energy conservation portion of the project.

7. 2019-20 to 2022-23 Energy Conservation Plan

7.1. Energy Management Strategies

7.1.1. Corporate Sustainability Plan

TVDSB embraces Environmental Citizenship and strives to be a proactive educational and corporate leader by modelling the values of environmental sustainability through conservation of natural resources, following effective energy management practices, reducing waste, pollution and creating conditions to empower students and staff to positively affect the environment and community in which their school is located. Part of our environmental commitment is to further develop a Corporate Sustainability Plan by engaging stakeholders from multiple departments to develop measurable objectives and to consider their role in both energy conservation and broader corporate sustainability.

7.1.2. Design/Construction/Retrofit

TVDSB continues to design, construct and retrofit its buildings to renew equipment, reduce energy consumption and Greenhouse Gas emissions. Over 86% of TVDSB buildings are over 20 years old and due to this the renewal needs are increasing as many building components are reaching the end of their lifecycle.

TVDSB's Facility Services team regularly reviews the feasibility of emerging technologies to determine feasibility of the technologies being integrated into TVDSB facilities.

TVDSB will continue to manage its energy demand by using building automation systems (BAS[9]) to optimize operation of building systems. TVDSB will continue to invest in renewal of BAS to improve performance of equipment while maintaining building comfort.

TVDSB's planned projects/ programs to reduce energy consumption are listed in Appendix B.

7.1.3. Energy Procurement

TVDSB makes decisions to purchase electricity and natural gas based on the recommendations of TVDSB's Energy Procurement Consultant. The consultant makes recommendations based on market intelligence, any supply requirement of LDC's such as Enbridge gas (formerly Union Gas) and timing. The consultant will then contact TVDSB's approved suppliers to request pricing based on TVDSB's requirements. When pricing that is within TVDSB's threshold for purchase, the consultant will aid in the execution of the contract.

TVDSB will continue to explore alternative energy procurement strategies as they become available.

7.1.4. Operations and Maintenance

TVDSB has completed significant investments over the past five years on energy conservation projects. With the implementation of new systems a robust documentation and training procedure is required to maintain energy conservation savings. TVDSB will enhance standard operating procedures, building operation guidelines and training programs for building operators. TVDSB will be utilizing recently developed tools, such as energy and maintenance alarm modules developed as part of the ongoing BAS renewal program, to help identify when systems are operating outside normal parameters ensuring pro-active maintenance is completed.

7.1.5. Occupant Behaviour

To reduce the dependence on capital funding to complete energy conservation projects TVDSB will focus efforts on occupant behaviours. TVDSB will begin to provide energy data to facilities for occupants to better understand how their behaviours may affect energy consumption. TVDSB will leverage the EcoSchools certification program as a way to communicate and increase participation in energy conservation projects.

[9] BAS or building automation systems are an automated system that controls the mechanical/ electrical systems of a facility.

7.2. Future Energy Conservation Goals

TVDSB has set an overall energy consumption reduction goal of 5% over the next five years. Table 5 illustrates a breakdown on a yearly basis. TVDSB will monitor actual consumption in comparison to reductions on a yearly basis.

Table 6: Annual Energy Intensity Conservation Goals

`	**Fiscal Year**				
	2018-19	**2019-20**	**2020-21**	**2021-22**	**2022-23**
ekWh/M^2	1.9	1.9	1.9	1.8	1.8
% decrease	1.0	1.0	1.0	1.0	1.0

8. Senior Management Approval of this Energy Conservation and Demand Management Plan

I confirm that (insert Board's name)'s senior management has reviewed and approved this Energy Conservation and Demand Management Plan.

_____ _____

Name Date

_____

Job Title

Appendix A

2013-14 to 2017-18 Energy Conservation Projects

	2013-14	2014-15	2015-16	2016-17	2017-18
Lighting					
High Efficiency Lighting Systems	$ 100,000	$ 548,500	$ 172,000	$ 556,000	$ 687,000
Outdoor Lighting	$ -	$ 123,000	$ 689,000	$ 510,000	$ 905,000
HVAC					
Efficient Boilers (near condensing)	$ 505,000	$ -	$ -	$ -	$ -
High Efficiency Boilers (condensing)	$ 92,000	$ 632,000	$ 2,734,000	$ 2,530,000	$ 2,978,000
Heat recovery/enthalpy wheels	$ 9,000	$ -	$ -	$ -	$ -
Energy efficient HVAC systems	$ 1,171,000	$ 2,654,000	$ 2,054,000	$ 4,310,000	$ 11,734,000
Energy efficient Rooftop units	$ 525,000	$ 117,000	$ -	$ 1,282,000	$ 1,617,000
High Efficiency Domestic Hot Water	$ 50,000	$ 37,000	$ -	$ -	$ -
VFD	$ 20,000	$ 25,000	$ 92,500	$ -	$ -
Controls					
Building Automation Systems	$ 260,000	$ 86,500	$ 248,000	$ -	$ 1,522,000
Real-time energy data for operators to identify and diagnose building issues	$ -	$ 48,000	$ 67,000	$ -	$ -
Building Envelope					
New Roof	$ 973,245	$ 2,563,000	$ 4,813,000	$ 9,337,000	$ 5,969,000
New Windows	$ 1,119,000	$ 1,600,000	$ 5,629,000	$ 535,000	$ 1,227,000
Total	**$ 4,824,245**	**$ 8,434,000**	**$ 16,498,500**	**$ 19,060,000**	**$ 26,639,000**

Appendix B

2018-19 to 2022-23 Planned Energy Conservation Projects

	2018-19	2019-20	2020-21	2021-22	2022-23
Lighting					
High Efficiency Lighting Systems	$ 2,350,000	$ 2,000,000	$ 2,000,000	$ 2,000,000	$ 2,000,000
Outdoor Lighting	$ 60,000	$ 250,000	$ 250,000	$ -	$ -
HVAC					
High Efficiency Condensing Boilers	$ 2,600,000	$ 2,500,000	$ 2,500,000	$ 2,500,000	$ 2,500,000
Heat recovery/enthalpy wheel audits and Maintenance	$ -	$ 25,000	$ 25,000	$ 25,000	$ 25,000
Energy efficient HVAC systems	$ 10,600,000	$ 4,000,000	$ 4,000,000	$ 4,000,000	$ 4,000,000
Energy efficient Rooftop units	$ -	$ 1,500,000	$ 1,500,000	$ 1,500,000	$ 1,500,000
High Efficiency Domestic Hot Water	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000
VFD	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000
Air Curtain	$ 80,000	$ -	$ -	$ -	$ -
Controls					
Building Automation Systems - Upgrade	$ 1,350,000	$ 2,000,000	$ 2,000,000	$ 2,000,000	$ 2,000,000
Improve quality of energy data	$ -	$ 25,000	$ 50,000	$ 50,000	$ 50,000
Building Envelope					
New Roof	$ 6,000,000	$ 6,000,000	$ 6,000,000	$ 6,000,000	$ 6,000,000
New Windows	$ 2,300,000	$ 2,300,000	$ 2,300,000	$ 2,300,000	$ 2,300,000
Total	**$ 25,415,000**	**$ 20,675,000**	**$ 20,700,000**	**$ 20,450,000**	**$ 20,450,000**

* Planned projects are contingent on Ministry of Education funding

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TVDSB has set an overall energy consumption reduction goal of 5% over the next five years. Table 5 illustrates a breakdown on a yearly basis. TVDSB will monitor actual consumption in comparison to reductions on a yearly basis.

Table 6: Annual Energy Intensity Conservation Goals

	Fiscal Year				
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ekWh/M²	1.9	1.9	1.9	1.8	1.8
% decrease	1.0	1.0	1.0	1.0	1.0

8. Senior Management Approval of this Energy Conservation and Demand Management Plan

I confirm that (insert Board's name)'s senior management has reviewed and approved this Energy Conservation and Demand Management Plan.

Jeff Pratt — Name

2019 July 02 — Date

Associate Director and Treasurer
Thames Valley District School Board